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RELATIONSHIP BETWEEN REVERSIBILITY SCORE ON CORRESPONDING LEFT VENTRICULAR SEGMENTS AND FRACTIONAL FLOW RESERVE IN CORONARY ARTERY DISEASE

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Background: Currently the indication of percutaneous coronary intervention is based on the fractional flow reserve (FFR) in the intermediate coronary stenosis. It is a simple, reliable and reproducible method, but it does not take into consideration the localization of stenosis. The aim of this study was to find correlation between the severity of perfusion abnormality detected by scintigraphy and the FFR value as well as the localization of a particular coronary lesion.

Material and methods: 28 patients (male: 22, female: 6, age 62 ± 7.62) were enrolled our retrospective analysis. The supplied left ventricular segments on the standard 17-segment polar map were rendered to each coronary branch. FFR measurements on 36 vessels (20 LAD, 6 LCx, 10 RCA) were compared with the myocardium perfusion SPECT studies performed before the invasive procedure. The lesions belonged to 6.47 ± 2.47 myocardial segments (range: 1–12). We introduced a new ischemic index by combining the FFR with the number of the corresponding myocardial segments (left ventricular ischemic index: LVli). This index was correlated with the regional myocardial perfusion defects identified on the scintigrams. Perfusion reversibility score of 2 or above was considered as indicative of active ischemia (regional Difference Score: rDSc).

Results: 13 lesion proved to be significant based on intracoronary pressure measurements ($FFR < 0.75$), which ones supplied 92 left ventricular segments. 50 segments showed reversibility out of the 92 segments (rDSc: 76). The remaining non-significant 23 FFR values (> 0.75) corresponded to 138 LV segments (rDSc: 21). Close linear relationship was found between the LVli and the rDSc ($p < 0.001$). Also a linear relationship ($p < 0.001$) could describe the connection between the FFR and the rDSc among the cases with lesion-associated myocardial territory of similar extensions (7–8 segments). Analyzing all the FFR values independently of the localization of the lesions, they also correlated significantly to the rDSc but the relation was less tight. LVli predicted active ischemia (> 2 rDSc) on myocardial scintigraphy with 77.8% sensitivity and 94.4% specificity when the cut off value was set to 0.96. FFR alone predicted the ischemia on the scintigraphy with 72% sensitivity and 94% specificity at the best 0.8 cut off value. The area under the Receiver Operating Characteristic (ROC) curve was significantly higher for LVli than FFR (0.92 vs. 0.78; $p = 0.03$).

Conclusion: The isotope data indicate that LVli > 0.96 associates clinically relevant stenotic lesion. In our opinion, the FFR value not alone, but together with the corresponding left ventricular segments should be taken into consideration for the correct clinical decision making.

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THE IMPORTANCE OF MYOCARDIAL PERFUSION SCINTIGRAPHY AND MULTISLICE CORONARY CT IMAGE FUSION IN SEVERE CORONARY CALCIFICATION

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Background: Even in the era of "state of the art" Multislice Coronary CT (MSCT) — 64 slices dual source — in the cases of serious coronary calcification the severity of coronary artery stenosis could be questionable. We investigated the diagnostic importance of MSCT and myocardial perfusion scintigraphy (MPS) fused imaging on this field — is there any ischaemia on MPS, if there is how severe is it and in the cases of questionable multivessel disease where is the culprit lesion?

Material and methods: In 23 cases with severe coronary calcification (Agatston Score between 410–3959!) where the results of MSCT was questionable as a second examination stress MPS was performed. The number of coronary artery stenosis (CAS) in 16/23 cases was 1 coronary artery, in 5/23 cases 2 CAS and in 2/23 cases 3 CAS. The subsequent stress-rest MPS were performed using ECG gated SPECT with Tc99m tetrofosmin. MPS results were evaluated with Interview XP, Emory ToolBox and Cedars-Sinai QPS-QGS software, scoring the perfusion, wall motion, wall thickening abnormalities in 4 grade score system. For image fusion PMOD 2.75, MIP-3D display and/or GE CardIQ software was used.

Results: The fused imaging showed significant ischaemia in 6/23 cases and the ischaemia was mild (score 1) or moderate (score 2). In 4/6 positive MPS cases the ischaemia was detected only on one coronary artery supply territories and in 2/6 MPS positive cases in two coronary arteries supply territories. We could found more severe ischaemia in the localization of culprit ("dominant") lesion. In every case the functional stress and rest parameters (ejection fraction, wall motion, and wall thickening) were normal.

Conclusion: In many cases of severe coronary calcification on MSCT the significance of coronary artery stenosis remains questionable. The physiological significance of coronary stenosis on MPS and on the MSCT-MPS fused images can help to the correct diagnosis. On the basis of our preliminary results (1) ischaemia (on MPS) in the cases with severe coronary calcification (on MSCT) could be detected only in a few number of cases (6/23) and (2) the ischaemia proved to be mild to moderate. (3) The localization of culprit lesion could be established as well.

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DIAGNOSTIC VALUE OF QUANTITATIVE ANALYSIS OF MYOCARDIAL PERFUSION SPECT IN DETECTING REVERSIBLE PERFUSION DEFECTS

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Background: to determine the positive predictive value (PPV) of myocardial perfusion scintigraphy (MPS) using quantitative parameters compared with coronaria angiography (CAG) findings as gold standard and to analyze false positive cases.

Material and methods: During a one-year periode 253 patients with known or suspected coronary artery disease (CAD) had perfusion defect on Tc99m-tetrofosmin stress-rest MPS in our department. A quantitative software (Cedars-Sinai QPS/QGS, score values) was used to evaluate perfusion defects. Severity and extent of stress perfusion defects were quantitated by summed-stress score (SSS), and reversibility by summed difference score (SDS) using a normal data base. Tissue attenuation correction was not applied. 86 of these 253 patients were investigated by invasive CAG within 1 month after MPS. 52-patients had significant coronary artery stenosis. PPV of reversible perfusion defects was determined in this group retrospectively.

Results: In patients without significant coronary stenosis on CAG ($n = 34$, false positive MPS) SSS was significantly less, than in patients with significant stenosis ($n = 52$, true positive MPS), 9.5 ± 5.02 vs. 14.0 ± 9.12 . The difference is statistically significant ($p = 0.03$). There was no significant difference between SDS values of the two groups (5.0 ± 3.98 vs. 6.0 ± 2.89 , $p = 0.82$). But if MPS was considered to be positive only with SDS equal or above 4, number of false positive results decreased from 34 to 12, and PPV increased from 62% to 86%. Majority of false positive perfusion defects (64.3%) were localized on the inferior wall, half of them had SDS value below 4.

Conclusions: According to our results, use of a higher cut-off value for significant perfusion defect is recommended to reduce the number of false positives cases, especially in case of inferior location. Evaluation of SSS value can help to avoid false positive MPS results.